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What Do Economic Models Tell Us About the Effects of the U.S.-Canada Free Trade Agreement?

STUDIES OF THE historic U.S.-Canada Free Trade Agreement have produced conflicting estimates of its economic effects.[1] Not surprisingly, the numerous changes resulting from the Free Trade Agreement will benefit some people and harm others. To summarize the agreement's effects, many studies have estimated the minimum amount that individuals who gain would be willing to accept to forego the changes and the maximum that those who lose would be willing to pay to prevent them.[2] Subtracting the value of the losses from the gains produces a measure of net national welfare change. Using such a measure, estimates for Canada, expressed as a percentage of total economic activity, range from large gains to small losses, while estimates for the United States range from small gains to small losses.

This paper closely examines five recent studies to better understand their estimates as well as identify why they contradict each other. While the five studies focus on the U.S.-Canada Free Trade Agreement, they represent the typical modeling approaches used to quantify the impact of changes in trade laws. Thus, the following discussion helps explain why these analyses often reach widely different conclusions about the same trade policy change. In addition, the discussion points out some limitations of these kinds of analyses.

AN OVERVIEW OF THE U.S.-CANADA FREE TRADE AGREEMENT

To assess the results and limitations of the different studies, the key aspects of the U.S.-Canada Free Trade Agreement first must be identified. The agreement, summarized in table 1, estab-

[1]See Coughlin et al. (1988) for an introduction to the theoretical arguments underlying protectionist trade policies and the empirical evidence indicating that the costs borne by consumers of such policies generally far exceed the benefits captured by domestic producers and government.

[2]This measure of welfare change is called an equivalent income variation. For a brief discussion of this measure, see Henderson and Quandt (1980).

Table 1

The Major Provisions of the U.S.-Canada Free Trade Agreement

Tariffs	Eliminates all tariffs on U.S. and Canadian goods by January 1, 1998.
Rule of origin	To prevent third-country goods from receiving preferential tariff treatment, goods must pass a "rule of origin" test. Goods produced entirely in the United States or Canada qualify immediately, while goods containing imports from countries outside the agreement qualify if they are processed enough to result in one of several specified changes in tariff classification.
Customs	Ends customs user fees for goods and duty drawback programs, which returns previously paid duties on imports when they are incorporated in goods subsequently exported, by 1994 for bilateral trade and duty waivers linked to performance requirements by 1998 (except for the Auto Pact).
Quotas	Eliminates import and export quotas unless allowed by the General Agreement on Tariffs and Trade or grandfathered by the Free Trade Agreement.
National treatment	Reaffirms General Agreement on Tariffs and Trade principle preventing discrimination against imported goods.
Standards	Prohibits use of product standards as a trade barrier and provides for national treatment of testing labs and certification bodies.
Agriculture	Eliminates all bilateral tariffs and export subsidies and limits or eliminates quantitative restrictions on some products, including meat. Eliminates Canadian import licenses for wheat, oats and barley when U.S. crop price supports are equal or less than those in Canada.
Wine and distilled spirits	Removes most discriminatory practices against wine or spirits imported from the other country.
Energy	Prohibits most import and export restrictions on energy goods, including minimum export prices. Requires any export quotas used to enforce short supply or conservation measures to share resources proportionately. Provides for Alaskan oil exports of up to 50,000 barrels per day to Canada.
Autos	Replaces the Canadian content rule for duty-free Auto Pact imports into the U.S. with tougher Free Trade Agreement content rule. (Most auto trade already is duty-free under the U.S.-Canada Auto Pact.) Does not change rules for Auto Pact-qualified companies importing duty-free into Canada, but does not allow new companies to qualify. Permits U.S. auto and parts exports that meet the Agreement rule to enter Canada at Agreement tariff rates, which phase out over 10 years. Ends all Canadian duty remission programs for autos by 1998.
Emergency action	Allows temporary import restrictions to protect domestic industries harmed by imports from the other country in limited circumstances.
Government procurement	Expands the size of government procurement markets that will be open to suppliers from the other country.
Services	Commits governments not to discriminate against covered service providers of the other country when making future laws or regulations. (Exempts transportation services.)
Temporary visas	Facilitates travel for business visitors, investors, traders, professionals and executives transferred intra-company.
Investment	Provides national treatment for establishment, acquisition, sale and conduct and operation of businesses. (Exempts transportation.) Commits Canada to end review of indirect acquisitions and to raise to C$150 million (in constant 1992 Canadian dollars) the threshold for review of direct acquisitions. Bans imposition of most investment performance requirements.

Table 1 (continued)

The Major Provisions of the U.S.-Canada Free Trade Agreement

Financial services	Exempts U.S. bank subsidiaries in Canada from Canada's 16 percent ceiling on assets of foreign banks. Ends Canada's foreign ownership restriction on U.S. purchases of shares in federally regulated insurance and trust companies. Reviews U.S. firms' applications for entry into Canadian financial markets on the same basis as Canadian firms' applications. Permits banks in the U.S. to underwrite and deal in debt securities fully backed by the Government of Canada or political subdivisions. Guarantees continuation of multi-state branches of Canadian banks.
General dispute settlement	Establishes a binational commission to resolve disagreements (except for financial services and countervailing duty and anti-dumping duty cases).
Countervailing duty and anti-dumping dispute settlement	Allows countries to continue to apply existing national laws. Replaces court review with a binational panel (when requested), which must apply national law in rendering decisions under international law.
Softwood lumber	Preserves the 1986 agreement with Canada on provincial pricing practices.
Culture	Exempts cultural industries from the Free Trade Agreement, but authorizes measures of equivalent commercial effect in response to actions otherwise inconsistent with the Agreement. Cultural activities exempted include the publication, sale, distribution or exhibition of books, magazines and newspapers; recording of all kinds; and radio, television and cable dissemination.

SOURCE: U.S. Department of Commerce, International Trade Administration, *Summary of the U.S.-Canada Free Trade Agreement* (February 1988).

lishes a free trade area to be phased in between January 1, 1989, and January 1, 1998.[3] By that time, the United States and Canada will have eliminated nearly all of the barriers restricting trade in goods and services between each other, while retaining their individual trade policies with all other countries.[4]

Trade Barriers

By January 1, 1998, all tariffs on merchandise trade between the United States and Canada will be eliminated. As table 2 reveals, prior to the agreement, U.S. tariff rates on imports from Canada were lower than Canadian tariffs on imports from the United States in every industry except transportation equipment, an industry in which virtually all tariffs on bilateral trade were removed previously. Some of the tariffs listed in table 2 have already been eliminated, some will be eliminated in five equal reductions (20 percent per year) on each January 1 beginning in 1989 and the remainder will be eliminated in 10 equal reductions (10 percent per year).[5]

The agreement is not limited to tariff barriers. Virtually all import and export restrictions, such as import quotas and embargoes, have been eliminated. Less visible trade barriers have been eliminated as well. For example, in government procurement, discrimination between U.S. and Canadian suppliers is prohibited on qualifying nonmilitary purchases exceeding $25,000, as defined in the General Agreement on Tariffs

[3]See Little (1988), Copeland (1989) and the U.S. Department of Commerce (1988) for summaries of the agreement.

[4]The retention of individual trade policies relative to nonpartner countries distinguishes a free trade agreement from a customs union. The countries in a customs union, such as the "pre-1992" European Community, have abolished trade barriers among themselves and have the same trade barriers on imports from non-member countries.

[5]According to the U.S. International Trade Commission (1990), requests from traders on both sides have prompted tariffs on more than 400 products to be eliminated more quickly than was originally agreed upon.

Table 2

Average Post-Tokyo Round Tariff Rates of the United States and Canada[1]

Industry	U.S. tariff rates on imports from		Canadian tariff rates on imports from	
	Canada	Other	United States	Other
Agriculture	1.6%	1.8%	2.2%	1.8%
Food	3.8	4.8	5.4	6.1
Textiles	7.2	9.1	16.9	16.4
Clothing	18.4	21.4	23.7	22.1
Leather products	2.5	3.8	4.0	8.7
Footwear	9.0	8.9	21.5	21.9
Wood products	0.2	3.8	2.5	4.9
Furniture and fixtures	4.6	2.9	14.3	14.1
Paper products	0.0	1.3	6.6	6.5
Printing and publishing	0.3	0.7	1.1	1.0
Chemicals	0.6	3.5	7.9	7.0
Petroleum products	0.0	0.1	0.4	0.1
Rubber products	3.2	2.0	7.3	6.0
Nonmetal mineral products	0.3	7.2	4.4	8.5
Glass products	5.7	5.8	6.9	7.9
Iron and steel	2.7	3.9	5.1	5.5
Nonferrous metals	0.5	0.8	3.3	2.7
Metal products	4.0	4.4	8.6	8.9
Nonelectric machinery	2.2	3.2	4.6	4.8
Electric machinery	4.5	4.1	7.5	7.1
Transportation equipment	0.0	2.5	0.0	2.5
Miscellaneous manufactures	0.9	2.0	5.0	5.3
Average	0.7	4.3	3.8	7.4

[1]Weighted by bilateral trade.

SOURCE: Brown, Drusilla K. and Robert M. Stern. "A Modeling Perspective," in Robert M. Stern, Philip H. Trezise and John Whalley, eds. *Perspectives on a U.S.-Canadian Free Trade Agreement* (The Brookings Institution, 1987).

and Trade (GATT). Currently, GATT prohibits discrimination on procurements exceeding $171,000.[6]

Industry Issues

The agreement also deals with trade issues peculiar to specific industries such as agriculture, automotive products, energy and alcoholic beverages. Tariffs affecting agricultural trade will be eliminated by 1998. Export subsidies and quantitative import restrictions on some products, like meat, were eliminated immediately. The countries also agreed to cooperate with each other in negotiations with other countries to eliminate all subsidies that distort agricultural trade.

Due to the 1965 U.S.-Canada Auto Pact, 95 percent of bilateral auto trade is already duty-free. A major issue, however, had arisen be-

[6]While the agreement virtually eliminates national discrimination between U.S. and Canadian producers, there is still discrimination between producers within the free trade area and those outside. When imported parts and materials are used in the production of a good that is shipped from one partner country to another, the origin of the good must be determined. In the agreement, goods with imported inputs qualify as North American if they have sufficient value-added to permit them to be exported under a different tariff classification than the one under which the inputs were imported.

cause Canada had been enticing Asian auto producers to locate production facilities in Canada by rebating duties (taxes) paid on parts imported to Canada when these parts, after some production activity, were then exported. All Canadian duty remission programs will be terminated by 1998. Until then, the agreement does not change the rules for companies already qualifying for duty-free imports into Canada under the existing auto agreement, although it does not allow any new firms to qualify.

Most trade restrictions on energy resources are prohibited. The exceptions are limited to cases of shortages, conservation or national security; however, even in the case of shortages, the reduced supplies must be shared between both countries.

Trade barriers on alcoholic beverages have been only partially eliminated. Although the agreement eliminates some barriers limiting the trade of wines and distilled spirits, Canadian barriers limiting the importation of U.S. beer will remain unchanged.[7]

Investment

The agreement provides national treatment for all aspects of the establishment and operation of businesses. This means that U.S.-owned firms in Canada and Canadian-owned firms in the United States will be treated as domestic firms. The agreement addresses U.S. concerns about Canadian policies designed to influence foreign investment. Specifically, Canada agreed to stop imposing performance requirements, such as requiring an investor to export a certain amount of goods, and, beginning in 1992, to stop screening U.S. direct acquisitions of Canadian assets of less than C$150 million (in constant 1992 Canadian dollars).

Financial Services

The concept of national treatment has been extended to financial services, making this the first time that the United States has reached a bilateral agreement covering all financial services. Virtually all discriminatory Canadian practices are eliminated. For example, the Canadian assets of foreign bank subsidiaries operating in Canada previously were limited to no more than 16 percent of all domestic assets of the Canadian banking system. Under the agreement, U.S. bank subsidiaries are no longer subject to this limitation on their market share.

Other Services

The agreement is also noteworthy because it is the first international agreement dealing with trade and investment barriers in the service industries. Many service industries such as transportation, basic telecommunications, health, education and social services, however, are not covered. Nonetheless, the principle of national treatment has been extended to most commercial services such as construction, tourism, computer services, wholesale and retail trade, management services and other business services. Since many of these require the movement of personnel for limited periods, the agreement changes immigration regulations to facilitate business-related travel.

Implementation and Dispute Settlement

The Canada-United States Trade Commission has been established to implement the agreement. This group will resolve disputes on all matters except financial services and those involving charges of either foreign government export subsidies, called countervailing duty cases, or sales of a good abroad at a price lower than is charged in the domestic market, called anti-dumping cases. Disputes involving financial services will be handled by a formal consultative mechanism between the U.S. Department of the Treasury and the Canadian Department of Finance. Countervailing duty and anti-dumping cases are subject to review, upon request, by a special binational panel.[8] This panel, whose decision is final, reviews the case in light of the domestic laws of the importing country. Thus, each country retains the right to enforce its own laws.

MODELING THE AGREEMENT: UNDERLYING ISSUES

The preceding overview identifies the many legislative changes. Researchers attempting to

[7]For additional information on U.S.-Canada beer trade, see Carter et al. (1989).

[8]The agreement's resolution of countervailing duty and anti-dumping cases is temporary. The United States and Canada have five to seven years to develop a permanent solution; otherwise, either country may terminate the agreement.

estimate their likely consequences face numerous issues involving economic theory, modeling approaches and measurement. While economic theory provides much assistance in modeling the effects of the agreement, it provides no definitive conclusion about the welfare consequences for a specific country. One aspect of the modeling process in which economic theory plays an important role is in the selection of the modeling approach. No matter which approach is chosen, the far-reaching nature of the agreement prevents some aspects from being incorporated into quantitative models. The wide range of trade barriers affected by the agreement poses further problems. To understand fully the usefulness of the studies discussed later, these underlying issues are examined below.

The Uncertain Welfare Effects of Changes in Trade Laws

International trade theory generally concludes that free trade leads to the most efficient utilization of the world's resources and, consequently, maximizes the value of world output. Every move toward freer trade, such as the elimination of trade barriers among a group of countries, however, does not necessarily increase national welfare.[9] The reason for this apparent contradiction is that the formation of a free trade area, while eliminating one trade distortion, creates another. The tariff reduction resulting from a free trade agreement will eliminate the distortion between domestic goods and imports from the partner country, a change that increases national welfare. A new distortion, however, is created between imports from the partner country and those from non-partner countries that reduces welfare.

These opposing welfare effects, illustrated in the shaded insert on pages 47-50, can be described very simply. If the formation of a free trade area results in the domestic production of some goods and services in one member country being replaced by imports of these goods and services from other member countries, then the greater specialization in production based on comparative advantage will enhance the economic welfare of the member countries. The term for this welfare-increasing reallocation of production is "trade creation."

"Trade diversion," however, occurs when lower-cost imports from outside the free trade area are replaced by imports produced at higher cost from a member country. This can occur because goods imported from a member are not subject to tariffs or other restrictions, while goods potentially imported from non-member countries continue to face the same barriers as before. This trade diversion shifts production away from the pattern consistent with comparative advantage.[10]

The relative magnitudes of trade creation and trade diversion determine whether the welfare of members rises or falls. Thus, it is natural to use quantitative models to assist in assessing whether the agreement is likely to be beneficial or harmful to the two countries.

Modeling the Effects of Trade Policy Changes: Two Approaches

The standard way to model the effects of international trade policy changes is to construct and solve a theoretical model using assumed values of critical parameters to derive the solution. General equilibrium models usually are chosen to capture the numerous market interactions that take place both within and among countries. Thus, the standard model used for this purpose is called an "applied general equilibrium model."[11]

Equilibrium in this type of model is characterized by a set of prices such that the market demand for each output and input equals the market supply. The market supply for each output reflects the production decisions of firms motivated by profit maximization. Input demand

[9]Viner (1950) showed that the formation of a customs union could have different welfare effects for partner as well as non-partner countries. Viner's finding is an example of the "theory of the second best." This theory shows that, if all conditions required to maximize welfare are not satisfied, then satisfying one or more additional conditions will not necessarily produce a higher level of welfare.

[10]The empirical importance of trade diversion for Canada can be doubted because, prior to the agreement, the majority of Canadian imports—more than 71 percent in 1986, according to the Council of Economic Advisers (1988)—were already provided by the United States. Thus, the chances that the share of Canadian imports provided by the United States would rise substantially are small. Note also that information contained in table 2 shows that average Canadian tariff rates on imports from the United States already were below those on imports from other countries.

[11]See Shoven and Whalley (1984) for an introduction to applied general equilibrium models. This introduction highlights how these models work using a numerical example. In addition, they provide a review of research using these models to examine international trade issues.

functions are derived from production functions that use only capital and labor. The market demand for each product in this model reflects utility-maximizing consumption decisions of individuals. Demand functions are derived from maximizing utility functions subject to a budget constraint. The budget constraint contains a measure of income generated through the supply of inputs that are used in the production process.

Values for parameters in the production and utility functions must be specified to solve such a model. For example, the elasticity of substitution between capital and labor in the production function, as well as that between goods in the utility function, must be specified.[12] The solution to the model, characterized by the market prices of the inputs and outputs and the corresponding quantities, ensures that market demand equals market supply for all inputs and outputs and that profits are zero in each industry. There are major differences, however, among models that fall into this category. The estimates discussed below rely on one of two fundamental theoretical approaches.

The traditional approach focuses on the gains from comparative advantage. A key assumption in the comparative advantage approach is that markets are competitive. Using the Heckscher-Ohlin approach to international trade, production costs vary across countries prior to international trade because of differences in the endowments of productive resources. Countries relatively well-endowed with certain resources are able to produce those goods whose production requires relatively large amounts of these resources at lower cost than other countries.

With free trade, countries gain by exchanging export goods that they produce at relatively lower cost for imports produced at relatively lower cost from other countries. In essence, trade allows each country to export its abundant productive resources in exchange for the relatively abundant productive resources of its trading partners. The existence of trade barriers prevents some of the gains from producing, trading and consuming on the basis of comparative advantage from being realized.

The alternative approach used in estimating the effects of the reduction of trade barriers applies standard models used in industrial organization to international trade. In this approach, most output markets are assumed to be imperfectly competitive rather than perfectly competitive. Frequently, the imperfectly competitive markets result from the existence of economies of scale in production. These economies of scale cause declining average production costs as the level of output expands. In this case, the increase in the size of the market for individual producers allows for gains from trade.[13]

Non-Quantified Features of the Agreement

Irrespective of the modeling approach chosen, several features of the agreement are not quantified.[14] Many of these features are potentially important and, thus, could significantly alter the agreement's net impact.

One of the agreement's goals is the creation of a more stable business environment for all forms of international business activity. Many Canadians believe secure access to the U.S. market is essential for Canadian economic prosperity, and that such access is being threatened by the U.S.' increasing use of trade laws for protectionist reasons.[15] As an example justifying this concern, Copeland (1989) notes that the United States recently placed a 35 percent import duty on Canadian shakes and shingles to protect U.S. producers.

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[12]The elasticity of input substitution is a measure of the responsiveness of the optimal labor/capital combination to a change in the relative prices of these inputs. The elasticity of substitution between goods is defined analogously.

[13]The welfare consequences of economies of scale can be negative. In models of trade between a large and a small country, Markusen and Melvin (1981) and Ethier (1982) show that the output of goods with increasing returns to scale in the small country might decrease rather than increase with a change from autarchy, a situation in which the country engages in no international trade, to free trade. The increase in average production costs in the small country may more than offset the benefits of specialization due to comparative advantage.

[14]Shea (1988) highlights similar aspects of the agreement that are not quantified.

[15]See Lea (1987) and Trezise (1987) for assessments of the Canadian perspective on this issue. The use of trade laws for protectionist reasons is termed "contingent protection." Contingent protection encompasses a range of import restrictions, such as anti-dumping and countervailing duties, escape clause petitions and legislation dealing with "unfair" international trade. Ethier (1988), p. 234, has argued that the "use of the anti-dumping law has greatly increased and the statute is likely to become a principal protectionist tool," while a recent article in *The Economist* (October 22, 1988), p. 16, referred to the "capricious interpretation and enforcement" of U.S. anti-dumping laws as a potentially important trade barrier.

A Supply and Demand Analysis of the Welfare Consequences of a Free Trade Agreement

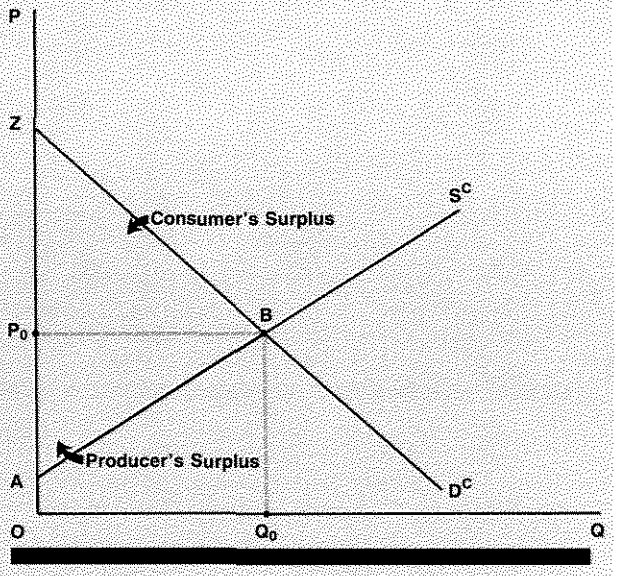
The models discussed in the text are general equilibrium models in that the prices and quantities of nearly all the goods and services are determined simultaneously. This approach is appropriate in assessing the consequences of the U.S.-Canada Free Trade Agreement because the reduction of tariffs on numerous goods sets in motion simultaneous adjustments in a large number of markets. The following discussion, however, is couched in terms of one good. Such an approach, termed partial equilibrium, is used because the primary theoretical welfare consequences of the Free Trade Agreement can be illustrated using supply and demand diagrams that are relatively easy to understand.[1]

Consumer's Surplus and Producer's Surplus

Underlying the welfare consequences of a tariff reduction are two standard welfare measures, consumer's and producer's surplus.[2] These measures can be illustrated simply using a supply and demand diagram. Figure 1 shows the Canadian supply, S^C, and demand, D^C, for a specific good. Equilibrium in this market is characterized by a price per unit of P_0 and a quantity of Q_0.

The benefits to Canadians from consuming this good are given by the area under the demand curve from O to Q_0 or area $OZBQ_0$. Since Canadian consumers pay a price per unit of P_0, their expenditures on the good are P_0 times Q_0 or area OP_0BQ_0. Consumer's surplus is the difference between the total benefits and the total expenditures, which is the triangular area P_0ZB. The supply curve indicates the price that producers must receive to induce them to produce each additional unit of the good. The area $OABQ_0$ represents the value of goods foregone (the costs) to

Figure 1
Welfare Analysis Using Supply and Demand Curves



produce this good. Producer's surplus is the area above the supply curve and below the horizontal line reflecting the market price or triangular area AP_0B.[3] These welfare measures can be added to generate an estimate of the increase in Canadian welfare from producing and consuming this good. Graphically, this is simply area AZB.

Trade Creation and Trade Diversion

The effects of a trade-creating free trade agreement are illustrated in figure 2. Identical to figure 1, S^C and D^C remain the Canadian supply and demand for a specific good. In figure 2, however, the Canadians can import the good from the United States at a fixed price of P_F.[4] From a national perspec-

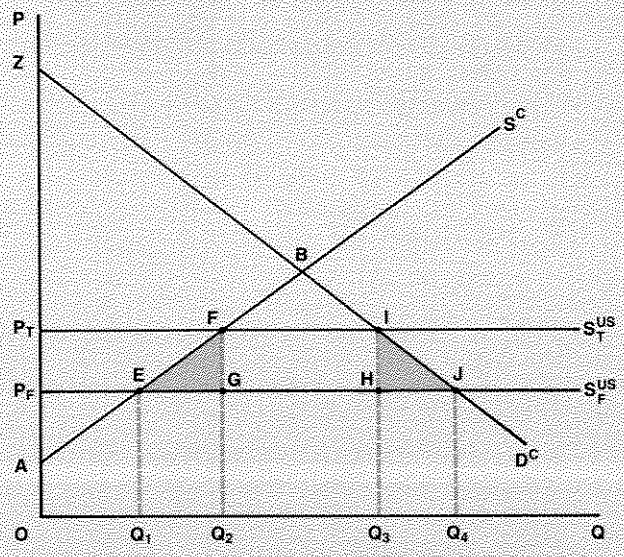
[1]The discussion ignores the welfare consequences of terms-of-trade effects.

[2]These welfare measures are widely used as approximate measures of the equivalent variation measure of welfare change that is actually used in the empirical studies examined in the text.

[3]In the text, a modeling approach based on comparative advantage is discussed. Such models assume production functions with constant returns to scale. When all supply curves are horizontal, producer's surplus is zero.

[4]The models discussed in the text generally assume that products in a given industry are slightly differentiated across countries. This assumption is ignored here to simplify the analysis.

Figure 2
A Trade-Creating Free Trade Agreement



tive, the supply of this good from the United States, S_F^{US}, is represented by a horizontal line. Even though Canadian production and consumption decisions are assumed to have no effect on the price that Canada pays for imports from the United States, Canadian trade policies can affect the price of this good within Canada. With free trade, the Canadian price of the good is P_F, the same price that Canadians pay to import the good from the United States. Thus, S_F^{US} represents the supply of imports of this good from the United States under free trade. If, however, a tariff equal to the distance P_FP_T is imposed on imports, then S_T^{US} represents the supply of imports relevant for Canadian production and consumption decisions.

Before the Free Trade Agreement, imports from the United States were subject to a tariff, so S_T^{US} is the relevant supply of imports. In this case, the price of this good in Canada is P_T, which means that Canadian production is Q_2 and consumption is Q_3. The difference between Canadian consumption and production, represented by the distance Q_2Q_3, reflects the quantity of Canadian imports from the United States. These imports are subject to a tariff equal to the distance P_FP_T, so the amount of tariff revenue (P_FP_T times Q_2Q_3) is the rectangular area GFIH.

The Free Trade Agreement eliminates the tariff on imports, so the price of this good in Canada becomes P_F. This lower price causes Canadian consumption to increase from Q_3 to Q_4 and production to decrease from Q_2 to Q_1. Thus, imports increase from Q_2Q_3 to Q_1Q_4. This is an example of trade creation because some production in Canada is replaced by imports from the United States.

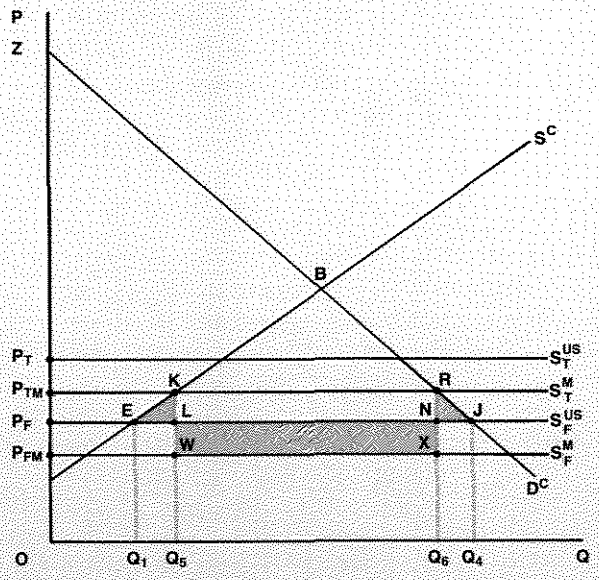
The Canadian welfare gain from this trade creation can be identified graphically. The elimination of the tariff, which allows increased consumption at a lower per unit price, causes consumer's surplus to increase by the area P_FP_TIJ. Part of this gain is a transfer from Canadian producers whose surplus drops by the area P_FP_TFE because of the lower prices and the resulting lower output they produce. The elimination of the tariff on imports from the United States means that the tariff revenue on imports from the United States, area GFIH, originally paid by Canadian consumers is returned to them as part of the increase in their consumer's surplus. After considering the transfers to consumers from producer's surplus and tariff revenue, the net Canadian welfare gain is represented by the sum of the triangular areas EFG and HIJ.[5]

The preceding analysis assumes that the United States is the lowest-cost foreign supplier of the imported good. Trade diversion arises, however, if the United States is not the lowest-cost foreign supplier. Figure 3 illustrates a trade-diverting free trade agreement. Figure 3 contains the same supply and demand curves as figure 2 plus two additional curves. S_T^M is the free trade supply curve of imports from a country M that is not a party to the U.S.-Canada Free Trade Agreement. S_T^M is the free trade supply curve adjusted by the tariff that Canada imposes on imports from this country.

Before the Free Trade Agreement, Canada imposes an identical tariff on imports of this

[5]The area EFG is referred to as the production effect, while the area HIJ is the consumption effect. Viner (1950), who pioneered this analysis, concentrated on the production effect and ignored the consumption effect. Thus, the definition of trade creation focuses on the replacement of domestic production by imports. It is now standard practice, however, to view trade creation as encompassing both the production and consumption effects.

Figure 3
A Trade-Diverting Free Trade Agreement



good from all countries. Thus, the distance $P_{FM}P_{TM}$ is equal to P_FP_T. Because Canada imposed the same tariff on imports from both countries, P_{TM} is less than P_T and Canadian imports of this good will be solely from M. Given the price of P_{TM} for this good, Canadian production is Q_5 and consumption is Q_6. Thus, imports from M are represented by the distance Q_5Q_6. The amount of Canadian tariff revenue is $P_{FM}P_{TM}$ times Q_5Q_6 or, more simply, the rectangular area WKRX.

The Free Trade Agreement eliminates the tariff on imports from the United States, but not on those from M. Since the price of the U.S.-produced good without the tariff, P_F, is lower than the price of the same good produced in M with the tariff, P_{TM}, Canadian imports will be diverted from M to the United States. In addition to the switch in Canada's imports from one country to the other, Canadian production declines from Q_5 to Q_1, Canadian consumption increases from Q_6 to Q_4 and Canadian imports rise from Q_5Q_6 to Q_1Q_4.

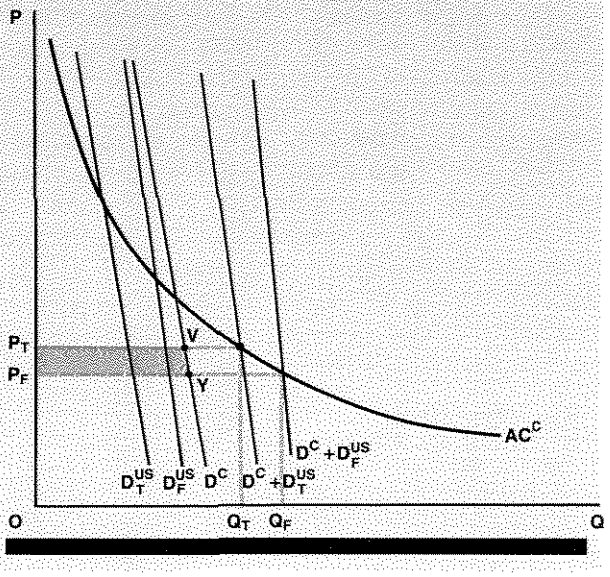
The net welfare consequences are unclear. Consumers are better off as a result of a lower price and increased consumption. The increase in consumer's surplus is represented by the area $P_FP_{TM}RJ$. On the other hand, Canadian producers are harmed by the lower price. The reduction in producer's surplus is the area $P_FP_{TM}KE$. Finally, since imports from the United States are not subject to a tariff, tariff revenue declines from WKRX to zero. Netting out these welfare changes leaves two triangular areas of gain, EKL and NRJ, and one rectangular area of loss, WLNX.

The two triangular areas are the same welfare gains that were highlighted in the previous example. The area of loss, WLNX, reflects the higher price that Canada pays per unit for Q_5Q_6, the amount of Q imported before the Free Trade Agreement. Obviously, if the welfare effect associated with trade diversion exceeds the sum of the two triangular areas associated with trade creation, then the net welfare change from the Free Trade Agreement is negative.

The Effects of a Free Trade Agreement Assuming Economies of Scale

The preceding analysis ignores the possibility that Canadian manufacturing may be characterized by economies of scale. Figure 4 shows a case in which Canada exports a good for which there are increasing returns to scale; this is illustrated by the negatively sloped average cost curve, AC^c, for Canadian producers. The demand for this product by Canadian consumers is represented by D^c;

Figure 4
Welfare Consequences of a Free Trade Agreement Assuming Economies of Scale



the demand by U.S. consumers for this product is represented by D^{US}. D_T^{US} is the U.S. demand before the Free Trade Agreement, while D_F^{US} represents the larger U.S. demand that results when the U.S. tariff on the Canadian-produced good is eliminated. Thus, $D^C + D_T^{US}$ represents the market demand faced by Canadian producers before the agreement and $D^C + D_F^{US}$ represents the market demand after the agreement.

Following Hill and Whalley (1985), Canadian producers are assumed to price their good at its average cost to highlight graphically the welfare consequences stemming from tariff reductions in the case of economies of scale.[6] With average cost pricing, the price and output levels before the agreement are determined by the intersection of the average cost curve, AC^C, with the market demand curve, $D^C + D_T^{US}$. Thus, the equilibrium price and quantity are P_T and Q_T. A reduction in U.S. trade barriers shifts the U.S. demand for Canadian exports of this good from D_T^{US} to D_F^{US}. This demand shift induces a production response as Canadian production increases from Q_T to Q_F. In addition, price declines from P_T to P_F.

Even though Canadian producers will not generate increased profits, there are net benefits for Canada. Canadian consumers benefit from increased consumption stemming from the price (cost) savings associated with economies of scale. This increase in consumer's surplus is represented by the area $P_F P_T VY$.

[6]Theory suggests, however, that if there really are increasing returns to scale at all levels of production, the result would be a monopolist who produces at an output level for which marginal revenue equals marginal cost and sets his price accordingly.

To provide a more stable business environment, the agreement set up a binational panel to settle disputes in anti-dumping and countervailing duty cases. Precisely how this panel will function, however, is unknown; moreover, it is virtually impossible to quantify the value of trade currently foregone because of these legal and political uncertainties that the agreement will reduce.[16]

A second feature of the agreement that cannot be quantified easily involves the consequences of the liberalized trade in services. Since models typically view the service sector as producing a non-traded service, they do not analyze explicitly the trade in services. Even if models allowed for trade in services, however, translating policies that discriminate against trade in services into tariff measures would be extremely difficult. Finally, it is hoped, especially in the United States, that the U.S.-Canada agreement of national treatment for service providers will encourage the current GATT negotiations to reach a similar agreement in a multilateral context. Though such an agreement would have far-reaching consequences, these consequences cannot be estimated in the context of the U.S.-Canada Free Trade Agreement.

Because most economic models incorporate the service sector, and all other sectors as well, at aggregation levels that lump many industries together, another problem is created. The costs and benefits of the agreement tend to be understated to an unknown degree; therefore, short of disaggregating the model, there is no way to tell precisely how much the costs or the benefits have been understated.

For example, using a two-digit Standard Industrial Classification scheme, transportation equipment is treated as one industry. The agreement, however, could cause one sector of transportation equipment to contract and another sector to expand. The movement of workers from the contracting to the expanding sector, which entails temporary unemployment and other costs for the affected workers, is not captured by a model that treats transportation equipment as a single industry.

On the other hand, this aggregation also underestimates the benefits of the agreement.

[16]According to the U.S. International Trade Commission (1990), the dispute settlement process reached decisions on two noncontroversial cases involving red raspberries and paving equipment during 1989. Upcoming cases involving steel rails and pork are expected to be controversial. The amount of trade under dispute in all current cases, which involve primarily agricultural commodities, is less than 0.5 percent of the value of bilateral trade.

Highly aggregated models, by averaging tariff rates across sectors within an industry, underrepresent the distortions caused by tariffs. In other words, tariffs appear to distort relative import prices by less than they actually do.[17] Eliminating these distortions is one source of the gains from the agreement because production and consumption decisions no longer will be artificially distorted. Since the elimination of larger distortions generates larger benefits, highly aggregated models understate the benefits associated with tariff reductions.

The models are also not well-suited to identify the gains resulting from other possible effects of the agreement. Positive effects can result from the increased competition stemming from reductions in trade barriers. When firms are insulated from competition, they may not minimize their production costs.[18] When owners are separated from managers, the absence of competitive pressures may allow managers to incur costs to achieve their own interests at the expense of reduced profits. The increase in competitive pressures from increased international trade increases the probability that production costs will be minimized.

In addition, these firms might be pressured into additional research and development expenditures that generate either new products or cost-saving production processes. The enlargement of the market might also attract new investment from non-partner countries. These possibilities, which are potentially significant, tend to be ignored by quantitative trade models.

Finally, all models share one other quantification problem: how to incorporate the elimination of non-tariff barriers into the analysis. This poses a problem because non-tariff barriers must first be identified and, then, converted into their tariff-equivalents.[19] Even if a non-tariff barrier can be identified, it is often difficult to calculate its tariff-equivalent accurately. For example, government procurement policies, a well-known non-tariff barrier, are not easily converted into an equivalent tariffs. As a result, estimates of the effects of eliminating trade barriers typically omit some non-tariff barriers. In addition, estimates based on non-tariff barriers must be viewed cautiously. Indeed, some researchers ignore non-tariff barriers entirely and simply report the consequences of eliminating tariffs alone.

EMPIRICAL ESTIMATES

Models based on either the perfect competition/comparative advantage or the imperfect competition approaches have been estimated to identify the welfare consequences of eliminating trade barriers in the agreement. To make the discussion of the agreement's overall effect on the United States and Canada manageable, the results of five recent studies are examined: Hamilton and Whalley (1985), Brown and Stern (1987 and 1989), Cox and Harris (1986) and Wigle (1988). As table 3 shows, these studies exemplify the different approaches and yield conflicting results. The studies by Hamilton and Whalley, and Brown and Stern (1987) are based on comparative advantage, while those by Cox and Harris, Wigle, Brown and Stern (1989) are based on imperfect competition.

The results conflict in terms of the gainers and losers as well as the magnitudes of these gains and losses. Depending on which study is used, the results show both the United States and Canada gaining, the United States losing and Canada gaining or the United States gaining and Canada losing. Relative to each country's gross domestic product, the welfare consequences for the United States range from −0.03

[17]A simple example can illustrate this argument. Assume two import-competing industries, each protected by an average 5 percent tariff rate; thus, the relative price distortions caused by the tariffs in each industry appear similar. For one industry, however, the average 5 percent tariff rate results from a 5 percent tariff rate for each sector. For the other industry, the average results from averaging a 10 percent rate and a zero percent rate. The latter industry has more distortions that the former because the differential tariff rates distort the relative prices across sectors. The effect of aggregation is to treat every sector within an industry as if it had the same level of protection from import competition. Consequently, the gains from eliminating the distortions within an industry are ignored. The higher the level of aggregation, the more these distortions within industries are ignored.

[18]This possibility, termed X-efficiency, has been stressed in a more general context by Leibenstein (1980).

[19]The tariff-equivalent of a specific non-tariff barrier is the tariff rate that would generate the same effect on the price of the imported good as the non-tariff barrier. To illustrate, assume first that world prices of some imported good are fixed. Like a tariff, a non-tariff barrier causes the price of the imported good to rise. A non-tariff barrier, such as a quota, causes this price increase by reducing the supply of imports. The percentage increase in the price of the imported good is the tariff-equivalent. For many non-tariff barriers, it is difficult to quantify the supply-reducing consequences of the barriers.

Table 3

Welfare Consequences of the U.S.-Canada Free Trade Agreement, Selected Studies

Authors	Model type	Trade barriers removed	United States[1]	Canada[1]
Hamilton/Whalley (1985)	Perfect competition/ comparative advantage	All	0.03%	0.63%
		Tariffs	−0.03	0.54
Brown/Stern (1987)	Perfect competition/ comparative advantage	All	0.04	−0.35
Cox/Harris (1986)	Imperfect competition/ economies of scale	All	—	8.74
Wigle (1988)	Imperfect competition/ economies of scale	Tariffs	0.06	−0.05
Brown/Stern (1989)	Imperfect competition	Tarrifs	0.09	1.00

[1]The value of the welfare effect in each country, calculated by an equivalent income variation, is expressed as a percentage of gross domestic product.

percent to 0.09 percent and for Canada, from −0.35 percent to 8.74 percent.[20]

Whether these changes seem large or small depends on your point of view. Hamilton and Whalley (1985), for example, found that the elimination of tariff and non-tariff barriers increased U.S. welfare by only 0.03 percent of gross domestic product in 1977, which may seem trivial. In dollar terms, however, the effect could be called substantial. Using 1977 prices, this rise in welfare is $0.6 billion. Using 1989 prices, the rise is $1.1 billion.

The conflicting and substantially divergent results from these studies are due to a variety of reasons. One key reason is that the values chosen for the elasticities of substitution between capital and labor and between different consumer goods vary across these studies. Table 4 lists several other characteristics that could explain the conflicting findings. These include the numbers of countries and goods, production functions, market structure, how prices are set and the mobility of resources. Some insights into the importance of these differences are provided below.

Perfect Competition/Comparative Advantage Models

Hamilton and Whalley's (1985) model departs from the textbook comparative-advantage model using the Heckscher-Ohlin approach in two ways. First, demand and production function parameters differ across countries and, second, products are heterogeneous rather than homogeneous across countries.[21]

The differences in demand and production function parameters across countries require specific assumptions about the structure of substitution possibilities for both demand and production. The assumed values for the elasticities of substitution in these functions determine the price elasticities associated with goods and factors of production. In turn, since products are differentiated by the country in which they are produced and their physical characteristics, these elasticities of substitution determine import and export demand elasticities for each country as well. Not surprisingly, the values chosen for these substitution elasticities determine the results generated by the model,

[20]Gross domestic product is gross national product less net property income from abroad. In 1987, Canadian gross domestic product was approximately 3 percent larger than gross national product, while U.S. gross domestic product was less than 1 percent smaller than gross national product.

[21]The disaggregation of imports of a product according to their places of origin is called the Armington assumption. For details, see Armington (1969).

Table 4

Summary of Model Characteristics

Characteristic	Hamilton/Whalley (1985)	Brown/Stern (1987)	Cox/Harris (1986)	Wigle (1988)	Brown/Stern (1989)
Number of countries	8	4	3	8	4
Number of goods					
Traded	5	22	29	5	22
Non-traded	1	7	0	1	7
Returns to scale					
United States	Constant	Constant	Not modeled	Constant	Constant
Canada	Constant	Constant	Increasing-manufacturing Constant-nonmanufacturing	Increasing-manufacturing Constant-nonmanufacturing	Constant
Market structure					
United States	Perfect competition	Perfect competition	Not modeled	Perfect competition	Imperfect and perfect competition
Canada	Perfect competition	Perfect competition	Imperfect competition-manufacturing Perfect competition-nonmanufacturing	Imperfect competition-manufacturing Perfect competition-nonmanufacturing	Imperfect and perfect competition
Price setting by noncompetitive firms	None	None	Monopolistic competition and collusive	Monopolistic competition and collusive	Monopolistic competition
Labor mobility					
Across industries	Yes	Yes	Yes	Yes	Yes
Internationally	No	No	No	No	No
Capital mobility					
Across industries	Yes	Yes	Yes	Yes	Yes
Internationally	No	Yes	Yes	No	No

and different assumptions yield quite different results.

The assumption of national product differentiation enables the model to generate intra-industry, bilateral trade flows since each country exports (and imports) differentiated products. Welfare analysis is complicated beyond the calculation of the efficiency gains and losses stemming from trade creation and trade diversion. Terms-of-trade changes occur because all countries in the model can have some control over their export prices by changing their tariffs on imports.

For example, a Canadian tariff reduction on imports from the United States, which lowers the price of these goods for Canadian consumers (but not for Canada as a whole), will cause Canadian consumers to substitute imports from the United States for some goods produced domestically. The reduction in demand for Canadian-produced goods causes a fall in the price of these goods both in Canada and the world market. *Ceteris paribus*, Canada is harmed by this decline in the price of Canadian exports relative to the price of Canadian imports; this decline produces an adverse terms-of-trade effect.

The welfare consequences, however, are not limited to the preceding terms-of-trade effect, because other things are changing as well. There are efficiency gains that benefit Canada associated with trade creation between the United States and Canada. In addition, the corresponding tariff reduction on U.S. imports from Canada allows for increased Canadian

sales in the U.S. market. The resulting increase in U.S. demand for some Canadian-produced goods will increase the price of these goods in Canada and the world market; this is another change that benefits Canada. Thus, there are beneficial and adverse terms-of-trade effects occurring simultaneously.

The net welfare consequences for Canada and the United States depend on the relative importance of these effects. From the Canadian perspective, the adverse terms-of-trade effects are larger if Canada's tariffs on U.S. exports are higher on average than U.S. tariffs on Canadian exports. This is, in fact, what is shown in table 2. Canadian terms of trade will also decline the more (less) similar U.S. and Canadian goods are to Canadian (U.S.) consumers.

Although Canada's tariffs on U.S. exports before the agreement were higher on average than U.S. tariffs on Canadian exports, Hamilton and Whalley still find that the gains from the agreement primarily accrue to Canada (see table 3). They attribute this finding to the fact that Canada is the smaller partner. The smaller partner's production and consumption behavior are less likely to affect world prices, enabling it to take greater advantage of the trade diversion effects in the larger region.

Yet, using a model with features similar to that used by Hamilton and Whalley, Brown and Stern (1987) found that the United States gained, but Canada lost. As shown in table 3, the bilateral removal of trade barriers by Canada and the United States leads to an increase in U.S. welfare, 0.04 percent of gross domestic product, but a decrease in Canadian welfare, 0.35 percent of gross domestic product. Brown and Stern argue that the reduction in Canadian welfare stems from the relatively higher Canadian tariff rate prior to the agreement. The removal of this protection, which causes Canadian consumers to substitute imported goods from the United States for Canadian-produced goods, leads to a reduction in the relative price of Canadian goods.

Why do these two studies differ so much with respect to the outcome for Canada? Brown and Stern found their results were sensitive to the assumptions about the elasticity of substitution among imports from various sources. In other words, the results were sensitive to the degree of substitutability between U.S. imports from Canada and the rest of the world and between Canadian imports from the United States and the rest of the world.

The greater the degree of substitutability, the larger the U.S. gain and the smaller the Canadian loss. If imports from various sources are close substitutes, the preferential tariff reduction induces a substitution from third-country suppliers to the partner. Relatively speaking, little substitution out of the domestically produced good occurs. As the demand for output from the third-party countries declines, the terms of trade for both Canada and the United States improves. Even for very high assumed values for the elasticity of substitution among imports, however, Brown and Stern found a decline in Canadian welfare.

Brown and Stern also examined whether the decline in Canadian welfare was associated with a movement of capital from Canada to the United States; this possibility could not occur in Hamilton and Whalley's model. While Brown and Stern did find a capital movement from Canada to the United States, the Canadian welfare loss is nearly invariant to different assumptions about the sensitivity of capital flows to U.S. and Canadian rate-of-return differences.

Models with Imperfect Competition and Economies of Scale

Models based on comparative advantage assume that all markets are perfectly competitive. This assumption is inaccurate for many markets in Canada. To address this issue and others, Cox and Harris (1985) developed a general equilibrium model of the Canadian economy that incorporates both economies of scale and imperfect competition.[22] In a later paper, Cox and Harris (1986) present estimates of economic effects of the Free Trade Agreement.

Wonnacott (1987) notes that the difference between many U.S. and Canadian manufacturing

[22]The model is not a complete general equilibrium model. The two sectors "foreign" to Canada, the United States and all other countries in the rest of the world, are summarized by exogenous import prices and a set of export demand functions.

operations has been a research topic for Canadian economists since the mid-1960s. Canadian manufacturers, especially those producing consumer durables, have tended to produce a wide range of products, each in relatively small quantity. The standard explanation is that diversified, small-scale production is caused by the trade barriers of both countries.

Canadian trade barriers, by protecting domestic producers from foreign competition, enable Canadian firms to produce a variety of products profitably, even though these products are expensive by international standards. Meanwhile, U.S. trade barriers restrict Canadian access to the U.S. market and, in turn, provide an incentive for Canadian producers to focus on the Canadian market.[23] Thus, the reduction of tariff barriers in the agreement should lead to expanded production with lower per-unit costs. The gains stemming from these changes are called rationalization gains.

Cox and Harris' modeling innovation was to incorporate economies of scale into the analysis. Production in each manufacturing industry is assumed to be characterized by increasing returns to scale, which results in lower per unit average production costs as output increases. Production in each non-manufacturing industry is assumed to be characterized by constant returns to scale.

Since non-competitive firms are price-searchers and, hence, set their prices to maximize their profits, assumptions about price-setting are required. Two price-setting hypotheses are used. One is a monopolistic competitive pricing hypothesis in which profit-maximizing firms set the price of their products as a given mark-up over their marginal cost of production. The size of the mark-up depends on the price elasticity of demand. The second hypothesis relies on a collusive model in which all firms set their prices equal to the world price plus the tariff.[24]

Cox and Harris combine these hypotheses by assuming that the actual prices are a weighted average of the monopolistically competitive and collusive prices. The set of these weighted prices that clears both goods and factor markets is the equilibrium set of prices for Canadian firms.

Irrespective of the pricing assumption, tariff reductions increase import competition and, thus, the prices of imported goods for Canadian consumers tend to decline. For monopolistically competitive firms, the increased competition raises the elasticity of demand and, thereby, reduces the mark-up over marginal cost. Similarly, the collusive price declines because it is set equal to the world price plus the shrinking tariff. The resulting stimulation of Canadian consumption is accompanied by an increase in output by Canadian firms to satisfy the zero-profit condition.[25]

Five sets of parameters, whose specific values are based primarily on previous estimates in other studies, are especially important in determining the equilibria.[26] A set of export price elasticities for Canadian firms is one set of parameters. The removal of U.S. tariffs on imports from Canada eliminates the difference between prices paid by U.S. consumers and prices received by Canadian exporters. The removal of U.S. tariffs tends not only to lower the prices for U.S. consumers of imported goods from Canada, but also to increase the prices received by Canadian exporters. The extent of Canadian penetration of the U.S. market depends on the responsiveness of Canadian exports to these price increases. Conversely, a set of Canadian import price elasticities is needed to assess the consequences of the reduction of Canadian tariffs.

As suggested above, an assumption about the weighting parameter is necessary to determine whether prices tend to be set more according to monopolistic or collusive behavior. The price-setting behavior influences the degree of the reallocation of productive resources that the agreement causes.

Estimates for the elasticity of the average cost curves for the Canadian manufacturing industries are used. These parameters play a key role in determining numerous results such as the potential gains from the reallocation of productive resources and the degree of increased sales in U.S. markets.

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[23]An additional incentive noted by Wonnacott (1987) for diversified, small scale production is caused by Canadian exposure to U.S. advertising that reinforces Canadian demand for a wide range of products.

[24]A fundamental problem with this assumption is that, because firms do not make profits in this model, there is no incentive to collude.

[25]This general description is only suggestive of the general tendency for firm output to expand. With Canadian resources fixed and numerous relative price changes, the output of each and every firm will not have risen when the new equilibrium is attained.

[26]Additional details on the calibration of the model can be found in Cox and Harris (1985).

A fifth set of parameters is the trade policy parameters. Foreign and Canadian tariffs, as well as tariff equivalents of some non-tariff barriers, are used.

Cox and Harris (1986) estimate that the elimination of all barriers to bilateral trade results in Canadian welfare gains of 8.74 percent relative to its gross domestic product (see table 3). They argue that this large gain is due to the preferential access to the U.S. market that Canadian producers will receive. As a small country, Canada benefits because the source of U.S. imports is diverted from other countries to Canada.[27] The Canadian benefits of this diversion are magnified because of the assumed economies of scale in Canadian manufacturing.

Another study of the agreement that incorporated scale economies was done by Wigle (1988). Despite incorporating similar features to those used by Cox and Harris, Wigle did not find large Canadian gains. As shown in table 3, Wigle estimates that the bilateral abolition of tariffs produces a slight reduction in Canadian welfare, 0.05 percent relative to its gross domestic product. Meanwhile, U.S. welfare increased by 0.06 percent relative to its gross domestic product. The sharp contrast between his results and those of Cox and Harris caused Wigle to explore the specific features of the two models that were responsible for the very different conclusions.

Cox and Harris combined the two assumptions about price-setting behavior—monopolistic competitive pricing and collusive pricing—by assuming that prices are set as a weighted average of the prices set by these methods. Wigle, on the other hand, assumed that all firms in the nonmechanical manufacturing sector used monopolistic competitive pricing, while firms in the equipment and vehicles sector used collusive pricing. According to Wigle, the differences in the pricing assumptions are negligible, and changes in them did not eliminate the difference in his and Cox and Harris' results.

Differences in the assumed values of trade elasticities, on the other hand, can produce substantively different results. Since Cox and Harris used much higher price elasticities of export supply and import demand for both Canada and the United States, Wigle reestimated his model using trade elasticities that were approximately twice as high as he used originally. In addition, he introduced capital mobility between Canada and the United States; this feature was used by Cox and Harris. These features did make Wigle's amended results closer to those of Cox and Harris; however, the latter's results were still twice as large as Wigle's new ones.

Wigle speculates that the rest of the difference between the results in these two studies are produced by two other factors. First, Cox and Harris assumed higher values for economies of scale; the greater economies of scale increase the welfare gains because the economy will become more specialized.[28] Second, Wigle used two manufacturing industries in his model, while Cox and Harris used 20. Disaggregated models may generate larger efficiency gains than more aggregated ones, because there is more scope for reallocating resources across industries.

While both the Cox and Harris and the Wigle models stress the role of economies of scale, Brown and Stern (1989) estimated a model with imperfectly competitive industries, but without economies of scale. Their model addresses criticisms that can be raised about previous models.

Brown and Stern ruled out economies of scale in their model because they doubted its significance for Canada. Canadian firms, because of already low U.S. tariffs, had access to the U.S. market. Thus, they argue, gains from the interindustry reallocation of resources are likely to be more important than intra-industry changes.

The Cox and Harris and Wigle models also incorporated collusive pricing. Given this assumption, trade liberalization causes increased output per firm. Brown and Stern suggest, however, that a collusive market structure is not likely to persist in the face of free entry. They also point out that market structures in Canada, as well as the United States, show much more variety than has been assumed in previous models. As a re-

[27]With bilateral free trade, the proportion of total Canadian trade accounted for by the United States rises from 71 percent to 76 percent. The volume of Canadian trade with the United States increases by more than 97 percent.

[28]Wonnacott (1987) notes that Cox and Harris did not make independent estimates of the economies of scale, but rather relied on previous estimates based on econometric and engineering studies. He notes that many econometric issues remain unsettled and that the engineering estimates are likely biased upward.

sult, Brown and Stern incorporate a variety of imperfectly competitive market structures into their analysis that do not rely on what they view as questionable assumptions about firm behavior.

Like the previously discussed Brown and Stern (1987) study, the model uses four countries and 29 industries, 22 tradeable and seven non-tradeable. Each industry is characterized by one of five market structures: perfect competition; monopolistic competition with free entry; monopolistic competition without entry; market segmentation with free entry; and market segmentation without entry.

Both perfectly competitive and monopolistically competitive industries are characterized by product differentiation. Product differentiation by country applies to perfectly competitive industries, while products are differentiated by firms in monopolistically competitive industries. Perfectly competitive firms determine their profit-maximizing output levels by setting price equal to marginal cost, while monopolistically competitive firms maximize profits by setting price as a mark-up over marginal cost.

Homogeneous (that is, identical) products are assumed for the remaining imperfectly competitive industries that are characterized by market segmentation. With segmented markets and each firm producing the same product within an industry, all firms selling to consumers in a specific country must charge the same price, though this price may vary across countries. Each firm, assuming that output by other firms is fixed, establishes a profit-maximizing price for each national market.

Equilibrium in each industry is characterized by zero profits. With free entry, the number of firms in equilibrium assures that price equals average total cost. For market structures without entry, the number of firms remains constant. Equilibrium prices are determined in world markets. Tariffs and exchange rates connect the equilibrium prices to the prices paid by consumers and received by sellers in the individual regions.

As shown in table 3, the welfare consequences of the bilateral elimination of tariffs are small. Canadian welfare rises by $2 billion, which is 1 percent of its gross domestic product in 1976. U.S. welfare rises as well, but only by $1.6 billion, 0.09 percent of U.S. gross domestic product in 1976.

CONCLUSION

Quantitative models produce conflicting results about the economic effects of the U.S.-Canada Free Trade Agreement. Results for the United States range from small negative to small positive effects on welfare, while results for Canada range from small negative to large positive effects. The conflicting results emerge both from different assumptions about market structures and the values of certain parameters associated with supply and demand and from differences in the level of detail as to commodities and countries. Since there is no consensus about the "best" assumptions, and because international trade theory provides no definitive conclusion about a nation's welfare following the formation of a free trade area, it is important that users of these models understand the reasons for their conflicting results.

Since the assumption of perfectly competitive markets throughout all sectors of all countries is unlikely to hold, the incorporation of imperfectly competitive markets is a promising development. Models that incorporate such markets raise a number of problems, however, because of the various pricing assumptions that have been used and the need for characterizing the extent of the economies of scale. These newer models are also more sensitive to the values chosen for the parameters than those based on perfect competition.

Perhaps just as important, several key aspects of the agreement are not included in these models because they are extremely difficult to quantify. These unmeasured aspects may be more important than the measured ones in terms of the final outcomes. Changes in the rules and procedures governing international trade and investment can yield large benefits that are not included in these models. For example, many Canadians believe that secure access to the U.S. market is essential for Canadian economic prosperity. Consequently, the Canadian assessment of the desirability of the agreement might hinge on whether or not the agreement provides this security. Analogously, the precedent-setting aspects of the agreement concerning services are likely to influence the U.S. assessment of the benefits of this agreement.

Thus, quantitative estimates derived from models are simply some of the many pieces of information that are useful in the decision process and, in some cases, may not represent the most important pieces.

Quantitative trade models have improved substantially in recent years. Nevertheless, as this review points out, let the user beware.

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